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KNEELING PAD WITH CANTILEVERED KNEECUP

FIELD OF THE INVENTION

The invention relates to a cushioning and protecting kneeling pad assembly to be secured to a leg with fastening straps located only below the knee.

BACKGROUND OF THE INVENTION

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There are a great variety of both vocational and avocational activities in which a person is required to spend a lot of time in a kneeling position with most of the body weight supported on the knees, but with frequent movement to a crouching or standing position for required mobility. Movements of the person among these positions has historically presented problems of discomfort in the attachment of kneeling pad devices to the legs as well as frequent

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misadjustment of the kneeling pad devices requiring inordinate attention for readjustment.

Kneeling pad devices typically have a cup-shaped portion covering the front, sides and top of the knee with plural straps to hold the kneeling pad to the leg. Walking movement after reaching an erect position from a kneeling position usually presents significant annoyance and/or discomfort due to interference between the knee and the cup-shaped portion as the leg repeatedly flexes at

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the knee. Most of the various prior art articulated knee protecting devices have failed to provide a simple relief of these problems without requiring some support between the knee pad and the leg at or above the location of the knee. Also, the components of prior art devices are typically sewn, riveted or otherwise secured together, thus precluding replacement of worn or damaged parts.

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SUMMARY OF THE INVENTION

Various deficiencies of the prior art are overcome by achieving the following objects of this invention in accordance with the ensuing summary and detailed descriptions of various

1 embodiments of the invention.

It is an object of the invention to provide a pad for protection of knees when kneeling which is readily attached and adjusted on the leg and which comprises a plurality of quick-detachable separable structural, shaping and cushioning ventilated layers.

Another object of the invention is to provide a comfortable kneeling pad which encloses
6 the front, sides and top of the knee to protect it from external forces and debris when the user is kneeling and crawling.

Another object of the invention is to provide an articulated kneeling pad assembly with a knee-protecting cup portion wherein the assembly is supported entirely by leg engaging fasteners located only below both the knee and the cup.

11 Another object of the invention is to provide an articulated kneeling pad assembly having an elongated lower spine or support member which is secured along the front of the shin of the user by appropriate fasteners with all other parts of the kneeling pad assembly supported from this lower spine.

A still further object of the invention is to provide an articulated kneeling pad assembly
16 with a knee-protecting cup portion wherein the cup portion during use has a knee-conforming shape but wherein the cup portion is movable to a position spaced from the knee when the user stands erect and remains spaced from the knee to minimize discomfort or annoyance during standing or walking.

A further object of the invention is to provide a kneeling pad assembly wherein the knee-
21 protecting cup portion comprises an upper spine or support member connected just below the knee by an articulated connecting joint to the upper end of the elongated lower spine support member.

1 Another object of the invention is to provide between the upper and lower spine members
an articulated hinged connecting joint structure having a hinge axis extending transversely across
the upper end of the elongated lower spine support member in front of the user's shin..

 Another object of the invention is to provide two selectable adjusted positions of the
upper spine member relative to the lower spine member, a first position in which the kneecup
6 engages the knee and a second position in which the kneecup is spaced from and out of contact
with the knee.

 Another object of the invention is to provide cooperating abutment surfaces on the upper
and lower spine members which collide to restrict the movement of the upper spine member
relative to the lower spine member to the range between the first and second positions.

11 A still further object of the invention is to provide cooperating detent surfaces on the
upper and lower spine members whereby the upper spine member moves relative to the lower
spine member to each of the first and second positions with a snap action to normally retain the
upper spine member in such a respective position.

 An object of the invention is to have a kneecup configuration whereby, upon rising from,
16 kneeling to standing positions, the rim of the cup is pushed by the upper leg of the user to move
the kneecup from its first to its second position. However, if the user moves from kneeling to a
sitting position on a stool or the like, the user can manually flip the upper spine member to its
second position if desired. When moving to a kneeling position contact of the upper spine
structure with the floor or other kneeling surface will assure that the upper spine will be in its
21 first position with the kneecup in contact with and cushioning and protecting the knee.

 In accordance with an alternative embodiment of the invention the kneeling pad assembly
has a resiliently biased pad on an upper spine which is constructed to move away from the knee

1 toward a spaced relationship with the knee when kneeling pressure on the pad is reduced upon
raising the knee from its kneeling position. This biasing of the pad may be achieved by adding a
biasing spring in the hinged joint between the upper and lower spine members.

Another alternative way of achieving this biasing force on the pad is to have the upper
and lower spine members integrally molded in their angled relative positions with the molded
6 angled connection self-biasing the pad toward a spaced position spaced from the knee when the
user is not kneeling, the pad being retained in its other extreme position by a detent structure.

A further alternative way of achieving a self- biasing force on the pad is to have the upper
and lower spine members integrally molded in collinear relative positions with the molded
connection biasing the pad toward the knee, the pad being retained in its other extreme position
11 by a detent structure.

In both the snap acting and the resiliently biased embodiments the upper spine member
has a stable position corresponding to a position in which the spine holds the kneecup and pad
spaced from the knee. In the snap acting version of the invention the detent configuration
provides a bistable arrangement wherein the upper spine is pushed to or from each of the bistable
16 positions where it is retained by respective detent structures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front perspective view of a hinged kneeling pad assembly with a kneecup
portion supported by an upper spine member which is forwardly articulated relative to a lower
shin supported spine member with tread members attached to the front of the upper spine
21 member

Fig. 2 is a rear perspective view of the kneeling pad assembly of Fig.1.

Fig. 3 is a plan view of one of two fastening straps used to secure the lower spine member

1 to the shin of the user.

Fig. 4 is a perspective view of the strap of Fig. 3.

Fig. 5 is a plan view of the kneeling pad assembly of Fig. 1.

Fig. 6 is a side view of the kneeling pad assembly of Fig. 1.

Fig. 7 is a top view of the kneeling pad assembly of Fig. 1.

6 Fig. 8 is an exploded front perspective view of the components of Fig. 1.

Fig. 9 is an exploded rear perspective view of the components of Fig. 1.

Fig. 10 is a plan view of the part of the assembly of Fig 3, but showing only the hinged upper and lower collinearly oriented spine members.

Fig. 11 is a side view of the part of the assembly of Fig. 3 but showing only the hinged upper and lower collinearly oriented spine members.

Fig. 12 is a top end view of part of the spine assembly of Fig. 11.

Fig. 13 is a front perspective view Figs. 10-12.

Fig. 14 is a rear perspective view of the spine assembly of Fig. 13 and showing relative positions of pins used to secure other parts of the kneepad assembly to the rear of the spine assembly.

Fig. 15 is a perspective of one of the four pins used in Figs. 1, 2, 5-9 and 14 to fasten shielding and cushioning parts of the kneeling pad assembly to the lower spine member along with the fastening straps of Figs. 13-14.

Fig. 16 is a perspective of one of the two pins used in Fig. 1-9 and 14 to fasten shielding and cushioning kneecap members on the upper spine member.

Fig. 17 is a rear exploded view of separated upper and lower spine members.

Fig. 17A is an enlarged portion of separated upper and lower spine members circled in

1 Fig. 17 to more clearly illustrate detent structures interacting between the spine members.

Fig. 18 is a perspective view similar to Fig. 17A but taken at a different angle.

Fig. 19 is a side view of the hinge portion of an alternative embodiment in which a coil spring biases the upper spine to an angled position spaced from the user's knee.

Fig. 20 is a side view of an integrally molded spine structure in which the upper spine
6 portion is biased to an angular position relative to the lower spine portion by the resilient hinge portion of the integrally molded spine structure which interconnects the upper and lower spine portions.

Fig. 21 is a perspective view of Fig. 20.

Fig. 22 is a side view of an integrally molded spine structure in which the upper spine
11 portion is biased to a collinear position relative to the lower spine portion by the resilient hinge portion of the integrally molded spine structure which interconnects the upper and lower spine portions.

Fig. 23 is a perspective view of Fig. 22.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

16 Referring to Figs. 1-2, the preferred embodiment of the present invention includes a two-part relatively articulated or hinged kneeling pad assembly 5 having an elongated lower hinged assembly structure 6 hinged at hinge pin 7 to an upper hinged assembly kneeling cup structure 8. The lower structure 6 is intended to be secured below the knee along the front of a user's shin by adjustable elastic quick release straps 9 (Figs. 3-4) and provides the only support for the
21 upper kneecup structure 8 which in the position of Figs. 1-2 is arranged to be held at an angle such that the kneecup structure 8 remains spaced from the user's knee.

An elongated spine member 11 is the principal supporting structural element of the lower

1 assembly structure 6. A shorter spine member 12 is the principal supporting structural element
of the upper assembly structure 8. Spine members 11 and 12 are hingedly interconnected by the
hinge pin 7 which extends transversely across the top end of the spine member 11 below the
user's knee.

The spline members 11 and 12 have surfaces adjacent the hinge pin 7 which collide or
6 abut to provide means to limit the range of angular swinging motion movement of the spline
member 12 relative to the spline member 11 to an acute angle of about 38 degrees between its
extreme angular position as is reflected in Figs. 1-2 and another position of spline member 12
which is collinear with spline member 11.

Figs. 5-7 are orthogonal front, side and top views corresponding to Fig. 1.

11 Fig. 8 is a front exploded view which helps to identify the shape of component parts of
Figs. 1. Fig. 9 is a rear exploded view which helps to identify the shape of component parts of
Figs. 2.

Both the lower assembly structure 6 and the upper assembly structure 8 each comprise
closely layered spine members, shaping and shielding members and cushioning members.

16 Adjacent the rear side of the hinged spine members 11 and 12 is an elongated flexible shaping
and shielding member 13 having a lower shin shielding portion 14 extending the length of the
spine member 11 and a cup-shaped upper shielding portion 15 at the upper spine 12 for shielding
the knee. These shielding layer portions 14 and 15 are interconnected by an integral folded and
pleated web portion 16 to permit relative flexing of the portions 14 and 15 as the kneeling pad
21 assembly hinges between its extreme angular positions.

As seen more clearly in Figs. 2 and 8 the inner surfaces of the shielding portions 14 and 15
are covered with cushioning layers 17 and 18 respectively. The inside face of the cushioning

1 layer 17 in the shield portion 14 is covered over most of its surface with a plurality of spaced
knobby projections 19 for comfortable contact with the user's shin. A central cushioning layer
portion 20 of cushioning layer 18 in the shield portion 15 is configured to withstand the greater
stresses imposed by the knee and has multiple ventilating apertures V aligned with multiple
ventilating apertures V' in the shielding portion 15. The flexible shielding portion 15 extends a
6 sufficient distance above the kneeling surface at the top and sides of the shielding portion 15 to
prevent debris and dirt from entering the area of the cushion portion 20 during use of the kneepad
assembly 5. The shielding portion is sufficiently stiff to enable the portion of the user's leg above
the knee to push the knee cup structure 8 from its position in contact with the user's knee, with
upper and lower spine members collinear, to its angled position (Fig. 1) when the user
11 straightens his leg as when moving from a kneeling position to a standing position.

The shielding layers 13 and cushioning layers 17 and 18 are provided with apertures which
accommodate the stem portions of the two pairs of fastening pins 21 (shown enlarged in Fig. 15)
and one pair of fastening pins 22 (shown enlarged in Fig. 16). Fig. 2 shows the inside shouldered
ends 23 of these pins embedded at spaced points in the cushioning layers 17 and 18 whereas Fig. 1
16 shows the outer ends of these pins with shoulders 24 held beneath pairs of buttonhole-like looped
ends of thin and slightly elastic ears 25, 26 and 27 extending from the sides of the spine members
11 and 12. The pairs of pins 22 in the lower spine member 11 have further outboard shoulders 28
arranged to be held in selected buttonhole-like adjustment openings 29 in the quick-release straps 9
(Figs.3-4) which extend around the calf of the user's leg to retain the lower assembly structure 6 of
21 the kneeling pad assembly 5 in a fixed comfortable adjusted position below the user's knee. The
strap openings 29 are readily manually slipped on and off the pin shoulders 28 to provide for quick
attachment and detachment of the lower assembly structure relative to the user's leg. The

1 configuration of pins 21 is shown in Fig. 13. The configuration of pins 22 is shown in Fig. 14.

As seen in Fig.1, the upper spine carries a pair of tread members 30 and 34 having flat coplanar non-skid outer surfaces engageable with a flat kneeling surface to keep the kneeling pad assembly from rocking from side to side during kneeling use. The tread members 30 and 34 have parallel pin-like projections 31 and 35 on their sides opposite the tread surfaces, which projections
6 are removably secured in holes 32 and 36 in projections 33 and 37 in the upper spine member 12.

In the exploded view of the lower and upper spine members 11 and 12 in Fig. 17, the slightly-resilient tip projections 40 and 41 on the lower spine member 11 are configured to extend in close fitting relationship into respective passages in the upper spine member 12. The circled area A of Fig. 17 is greatly enlarged in Fig. 17A to better illustrate small inwardly projecting
11 protuberances 44 and 45 on the respective projections 40 and 41. In the assembled positions of the spine members 11 and 12, wherein the hinge pin 7 is inserted into coaxial hinge pin openings 47, the projecting resilient tips 40 and 41 are able to flex outwardly in the spaces 50 and 51 at the rear of the passages 42 and 43 as seen in Fig. 12A. The hinge pin 7 is fitted in the spine members 11 and 12 to maximize freedom of pivoting movement of spine 12 relative to spine 11. As the upper
16 spine member moves in alternate directions between its extreme angular positions, the tip 41 flexes outwardly in space 51 permitting the protuberance 45 thereon to snap past an angular raised rib 55 on the upper spine member 12 in space 51. Thus the tip 41, protuberance 45 and rib 55 form a detent structure for holding the upper spine member 12 in either of its extreme positions. The tip 40, protuberance 44 and another mirror image rib 55 (Fig.18) in space 50 define a second similarly
21 functioning detent structure. Each detent structure forms two respective detents, located in each of the spaces 50 and 51, which detents are active, depending upon which side of the rib 55 is engaged by the corresponding protuberance 45 to hold the upper spine either in the first stable knee

1 engaging position collinear with the lower spine or in the second stable position angled with
respect to the lower spine to keep the upper spine spaced from the knee.

In the foregoing preferred embodiment detents located at one or both of the spaces 50 and
51 provide the entire means for selectively retaining the upper spine in either of its two stable
positions and the upper spine is selectively forced by the user either manually or by alternately
6 kneeling and standing to be alternatively moved between the two stable positions.

All of the components of the kneeling pad assembly are made of moldable plastic materials.
The spines 11 and 12 are made of relatively stiff plastic with ears 25, 26 and 27 of sufficient
resiliency to slide over and be retained on the shoulders on pins 21 and 22. The straps 9, shielding
member 13 and pins 21 and 22 are made of a flexible rubbery water-resistant elastomer. The
11 cushion members 17 and 18 may be made of resilient dense non-porous closed cell foam material.
Tread members 30 and 34 are made of durable non-skid rubber-like material.

An alternative embodiment shown in Fig. 19 uses a detent as described above to retain the
upper spine in its first stable knee engaging position collinear with the lower spine, but utilizes a
coil spring 70 coaxial with the hinge pin 7 to bias the upper spine to second stable position angled
16 with respect to the lower spine to keep the upper spine spaced from the knee. Ends 71 and 72 of the
coil spring are suitably anchored to the lower and upper assembly structures 6 and 8, respectively.
During use, the upper spine may be moved manually or by kneeling from its second stable position
to its second stable position. Reverse movement of the upper spine is selectively effected manually
or by standing.

21 Another alternative embodiment (not shown) may be constructed very similar to that of Fig.
19, but utilizes a coil spring coaxial with the hinge pin 7 to bias the upper spine to first stable knee
engaging position collinear with the lower spine and utilizing a detent as described to retain the

1 upper spine in its second stable position angled with respect to the lower spine to keep the upper
spine spaced from the knee. During use, the upper spine may be moved manually or by standing
from its first stable position to its second stable position. Reverse movement of the upper spine is
selectively effected manually or by kneeling.

Another alternative embodiment shown in Figs. 21-22 uses a detent as described above to
6 retain the upper spine 112 in its first stable knee engaging position collinear with the lower spine
111, but utilizes an integral molded resilient hinge interconnection 107 between theses spines and
replacing the hinge pin 7 of prior embodiments to bias the upper spine to second stable position
angled with respect to the lower spine to keep the upper spine spaced from the knee. During use,
the upper spine may be moved manually or by kneeling from its second stable position to its
11 second stable position. Reverse movement of the upper spine is selectively effected manually or by
standing.

Another alternative embodiment shown in Figs 22-23 is constructed very similar to that of
Figs. 20-21, but utilizes an integral molded resilient hinge interconnection 207 between lower and
upper spines members 211 and 212, replacing the hinge pin 7 of prior embodiments to bias the
16 upper spine to first stable knee engaging position collinear with the lower spine and utilizing a
detent as described above to retain the upper spine in its second stable position angled with respect
to the lower spine to keep the upper spine spaced from the knee. During use, the upper spine may
be moved manually or by standing from its first stable position to its second stable position.
Reverse movement of the upper spine is selectively effected manually or by kneeling.

21 It will be apparent to one skilled in the art that modifications may be made to the illustrated
embodiment without departing from the spirit and scope of the invention as hereinafter defined in
the claimed embodiments.